below, finds at once in these clouds a place of rest into which it draws like water into a sponge, and at the same time a conveyance through its opponent, the air, towards the object of its attraction. During this process of concentration above and below, both electricities begin to exercise their mutual influence, their inherent magnetic power having increased with their accumulation, so as to bring them, as it were, within sight of each other: the saturated cloud, joined by others floating in the air and likewise attracted by one another, begins to lower as it becomes larger and more charged, and its movements are more or less directed by the accumulation of negative electricity, which draws it down, by atmospheric currents, and by the face of the country. If the place be mountainous, thunderclouds will sometimes approach from opposite directions, and hover about the tops of hills and mountains as if they would not leave them.

The negative electricity tending to rise, and at a certain height finding itself everywhere impeded by a denser and colder state of the air, seeks a conductor, by the side of which it meets with less opposition. Thus, resisted by the higher atmosphere, it leans against any elevated object that may be near, ascending close to its surface and that of the air pressing against it, forming, as it were, a continually upward flowing stream, towards which the electricity of the vicinity takes its course and keeps up the supply. The fluid, however, will prefer such conductors as have most affinity to it,—namely, all those bodies that contain a great, if not the greatest, amount of latent heat, or latent electricity, like metals, trees, &c. The more pointed the conductors, the more easily will the stream, forced on from below, quit its hold, and emerge into the opposing atmosphere: the rounder or longer the upper extremity of the conductor, the more the negative fluid will accumulate there, and the more difficult will be its passage away into the air.

In this manner, then, the negative electricity floating on the earth or on the sea, is directed in as many streams upward as there are conductors, and the better the conductor the more concentrated or condensed will be the stream: the best and highest conductors take the lead, and in most cases absorb the lower and lesser streams of the vicinity. If on the sea, a ship will be the conductor towards which the electricity of the surface will incline: on land, the chief conductors will be elevated buildings, particularly steeples with metal vanes, &c., trees, as also the human body and animals in an erect position, where higher conductors are wanting. In the case of mountains, the fluid will creep up the sides, and arrive at the summit more and more concentrated, like many streams merging into one: hence its power at this elevation to attract and arrest electric clouds. Vapours will also continue to rise from the earth, and, charged with the negative electricity through which they ascend, they will form into light clouds, and rapidly take their direction towards the positive clouds above.

By these means, the atmosphere is filled with streams and volumes of the negative fluid, and the stronger and higher they are, the more they will attract and hold fast the electric clouds: the negative clouds will swell the positive ones, and they will amalgamate without explosion, if the former be but lightly charged with the fluid: if heavily charged, the mutual attraction is stronger and more vehement, and the point of union at a greater distance: the intervening air is sufficiently dense, and the friction sufficiently great, to ignite the positive fluid in its passage to the negative cloud, and thus the union of the two clouds will be accompanied with lightning.

In the same way, when within the point of union, the positive electricity will dart forward from its hiding-place towards the electric streams from the earth, ignite by the friction with the air it has to pass through, and cause as many volumes to explode in the air, or down to the very bowels of the earth if uninterrupted, as may be dense enough and within its magnetic reach, to be capable of ignition.

In all cases, where resistance of the air to the amalgamation of the two electricities is not sufficient to cause ignition, the union will take place without the appearance of lightning, and have the same destructive effect without the fire, though no such effect will be visible, if the two electricities are not of sufficient density.

The stronger a cloud is charged with electricity, the blacker will be its appearance: magnetism will hold the fluid together in as compact a body as possible, and the vapours of the cloud are consequently contracted, with the charge they contain, into a much denser body than in the ordinary way.

By a similar process to the above, waterspouts are formed at sea.

In a "dead calm" the sun exercises, as a matter of course, a more powerful influence on the water than he does when it is in any way agitated: by the intensity and accumulation of his rays on the quiescent surface, the air resting upon it is unusually rarefied; an extraordinary evaporation takes place, as if the sea were steaming; and an immense quantity of negative electricity is produced or liberated. The electric fluid, tending to rise, and the air being opposed to its passage, unites with the generated vapours as a better—in this instance as its only—*conductor*: the particles of vapour are heavier than the expanded air and unable to ascend to form a cloud; therefore, attracted and held together by the electricity they contain, and trying to force a passage upwards, they all move towards the centre of the foggy surface, until by degrees the whole mass assumes the shape of a funnel upside down, and becomes more and more elevated. In the absence of a conductor, this body of electrified vapours forms, as it were, a wedge in the shape of a cone, to part and penetrate the impeding air, through which it otherwise could not ascend. Whilst this forming of the wedge, or screw, takes place, the air round about cannot entirely remain passive, but is slightly set in motion by the spiral-like accumulation in the centre, in the same direction as the wedge is screwing or winding itself upward; and by degrees the air will press heavier on the outer side of the funnel, and less and less towards the middle, where it meets with less surface, and where its pressure is more slanting, so as to help in the formation and raising of the negative pyramid.

The rising of this electric pyramid, however, would not take place, if before, or at the same time, no cloud had been forming in the sky, saturated with the positive electricity of the upper regions, and exercising its attractive power on the kindred body below: the two fluids tend to union, but have no "go-between," no *conductor* to effect it. Thus, it is the attraction from above that makes the negative vapours (unable to rise, being heavier and denser than the air) assume the natural shape of a funnel-like wedge, whilst the attraction from below, in the absence of numerous and widely dispersed conductors, causes the same appearance in the cloud above: it is a kind of mutual magnetic suction, the one causing the wedge or cone above, and the other causing the cone below, until they meet, the former at the same time pressing by degrees upon the air, and setting it likewise in motion.

That previous to, or on their actual meeting, no explosion is taking place, may be accounted for in several ways.

In the first instance, though the extreme point of each cone may be seen, yet it is likely that each one sends forth some rays, or thread-like streams of electricity, as a feeler—an advanced guard,—to prepare, as it were, the way, which the increased force of magnetism, concentrated like the rays of the sun in a burning-glass,—acting now like a minute bridge from the point of one cone to the point of the other,—has made penetrable. These fore-posts meet long, or at least some time, before the visible cones come in contact; therefore, the amalgamation of the two fluids, diffused over a large space of vapours, and the union of the two cones, is so gradual, that no ignition can take place, there being no friction, or but very little, with the air.

The absence of explosion may, in the second place, be accounted for by the exceedingly saturated or condensed state of the vapours: they are too much like water to let the electric fluids have an easy escape, though it does not diminish their relative attraction, their impetuous inclination being only somewhat fettered.

When the union of the two cones has been accomplished, and the two fluids have been amalgamated, the whole, being now too condensed to be held any longer in suspense by the air, will violently burst, or come down in rain or hail, and, as may be, with lightning or without, accompanied with great noise, though without thunder.

All these phenomena may easily be accounted for, particularly the bursting, the rain and hail. Lightning will more or less depend upon the density of the respective cones and their admixture with air during the amalgamation of the two electricities; and the lightning taking place within the cones, and merely flashing out (as it is said), readily explains the rumbling noise; but not traversing, nor striking through the exterior atmosphere, as is the case during thunderstorms on land, accounts sufficiently for the absence of thunder.

If the "dead calm" at sea extends to a great distance, several waterspouts may naturally happen at the same time, each one forming its own centre.

Their motion on the water seems to depend upon the upper currents of the atmosphere: the positive cone leading the negative one: they may also move in the direction of a ship or a point on land, as centres of attraction and conductors to the electricity by which they are surrounded.

Waterspouts on land happen from the same causes as those at sea; from the high position of positively electrified clouds, and from isolated and powerful conductors of negative electricity from the earth.

The strong winds that generally attend thunderstorms arise from the previously rarefied state of the air, and the pressure of enormous clouds upon the atmosphere: to the rarefied place denser air will naturally flow, and the cloud, or clouds, form, as it were, a bridge, or so many bridges, under whose arches the air will stream with the greatest violence; and the more bulky the bridge, the more impetuous the rush. The rarefied atmosphere will of itself already contract, and make room for more air, owing to the condensation caused by the withdrawal of the rays of the sun behind the cloud.

What effect the rays of the sun may have upon the cloud I am not prepared to say, but merely beg to direct attention to the point.

There may be inaccuracies in this exposition of my theories, but I am sure you will excuse them, not having much time to devote to these objects. I hope, however, that they will be further developed by abler men, and by such as have the opportunity of practical examination and more extensive research.

W. Adolph.

NOTES IN THE PROVINCES.

Cleveland.—It appears that a rich bed of iron-stone, of great extent, has been discovered in Cleveland, between Stokesley and Whitby. According to a report of one of the Government inspectors of mines, made in a private capacity, "the principal seam varies from 10 to 15 feet in thickness, and there are two smaller seams lying below it, varying in thickness from 6 inches to 2 feet each." He declares that "as to quantity it is inexhaustible," and "the cost of working it a mere trifle." It contains 33 per cent. of iron in the uncalcined stone; and he adds, "there is little doubt of its creating a greater revolution in the iron trade than that which resulted from the discovery of the black band in Scotland. In no part of the country could iron be produced so cheaply as in this district. The Cleveland Hills will become the centre of the largest iron district in England."

——On the 22nd ult., Captain Cook's Memorial School, at Marton, in Cleveland, was opened. The buildings have been erected from designs by Mr. R. C. Carpenter, architect. The contractors were—Mr. M. Bowser, of Stockton:

For Info on OCR and PDF Compression go to ThePaperlessOffice.org